

## REDEFINING THE ECONOMICS OF ENTERPRISE STORAGE

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Enterprise storage has long delivered superb levels of performance, availability, scalability, and data management. But enterprise storage has always come at exceptional price, and this has made enterprise storage unobtainable for many use cases and customers.

Most recently Dell introduced a new, small footprint storage array – the Dell Storage SC Series powered by Compellent technology – that continues to leverage proven Dell Compellent technology using Intel technology in an all-new form factor. The SC4020 also introduces the most dense Compellent product ever, an all-in-one storage array that includes 24 drive bays and dual controllers in only 2 rack units of space. While the Intel powered SC4020 has more modest scalability than current Compellent products, this array marks a radical shift in the pricing of Dell’s enterprise technology, and is aiming to open up Dell Compellent storage technology for an entire market of smaller customers as well as large customer use cases where enterprise storage was too expensive before.

### THE DELL STORAGE SC4020

At the heart of the SC4020 is a new controller that unlocks a smaller, highly efficient footprint and opens up new price points and an entirely new market. While maintaining a software architecture the same as Dell’s enterprise SC8000’s traditional dual



**Figure 1: Back panel of a Dell Storage SC4020 controller and drive shelf, showing both controller modules and the assortment of connectivity/ports.**

separate 2U controllers (without storage capacity), the SC4020 is now a single 2U appliance with 24 small form factor (SFF) drive bays. To get to this dense footprint, Dell has designed the SC4020 with limited scalability appropriate for the mid-market; an SC4020 can scale up to 120 HDD or SSD SAS drives, versus the SC8000’s 960 drive maximum configurations. With this requirement for less scalability, the SC4020 is connected to fewer IO paths, and Dell has been able to optimize the controller’s density and cost effectiveness while maintaining excellent performance profile as well as a feature set that is same as the SC8000. Specifically, the SC4020 controllers now utilize latest generation Intel Xeon quad core processors in place of the SC8000’s prior generation dual processors, and have a fixed total controller cache of 32GB versus configurable cache that could scale to 128GB in the SC8000. Each controller node in the SC4020 chassis comes equipped with a smaller assortment of PCIe 3.0 connected SAS ports (2 per controller, 4 total), Fibre Channel ports (4 per controller, 8 total), and iSCSI via Intel Ethernet 10GbE ports (2 per controller, 4 total), and is still plumbed into the Ethernet and Fibre Channel fabric as a separate physical device, maintaining the same fabric pathing and failure domain approach as today’s SC8000 systems. Finally, the SC4020 still

supports a wide range of drive types, including both SLC and MLC SSD that can be used simultaneously as different tiers supporting different types of IO.

This evolution in controller architecture means more density, efficiency, and cost effectiveness that opens up a wide range of practical use cases. But most importantly, the SC4020 continues to leverage the proven portfolio of combined technologies from Dell's past Compellent acquisition alongside Intel processing power to offer customers some serious efficiencies and IT capabilities. Let's take a look at these key capabilities, and why this introduction of the SC4020 stands to bring tremendous benefit to a number of new customers.

### **Dell Storage SC4020 – Uniquely Cost Effective**

Dell is bringing the SC4020 to market with this new hardware architecture in order to introduce a disruptive price break-through that stands to put enterprise storage capabilities and field proven enterprise storage features within the grasp of nearly any storage customer. Using this architecture, SC4020 configurations with a minimum number of disks are available at price points in the vicinity of \$40,000. This configuration is not bare bones, but includes popular features such as Dynamic Capacity, Enterprise Manager, and Data Instant Replay.

Moving beyond this base configuration though, Dell has also SMB-optimized the pricing of other software features in two different packages: a Performance bundle that includes Data Progression and FastTrack, and a Remote Data Protection bundle that includes synchronous and asynchronous replication technologies. Other software features and hardware options – including Dell's FS8600 NAS appliance that integrates with the SC4020 – remain available on an a la carte basis, allowing customers to configure a storage system that is cost-optimized for their needs.

### **SERIOUS EFFICIENCY – DATA PROGRESSION EVERYWHERE**

Dell has built an industry-leading reputation for sophisticated data tiering and optimization with their Data Progression technology. Data Progression works on the idea of optimizing the placement of "data pages" that are 512KB, 2MB (default) or 4MB chunks of data that make up virtual volumes. Data pages are profiled and monitored over time, and then based on amount and type of IO, they are moved to optimal tiers of disk – e.g. SSD or performance or capacity-optimal SAS.

With the use of Data Progression, Dell customers typically rave about the overall storage efficiency they achieve, with higher levels of utilization, and Intel powered energy-efficient performance that is auto-optimized to meet the needs of any mixture of applications. Overtime, the typical customer recognizes additional value as the system scales and continues to maintain this optimization. With the SC4020, this effortless on-going optimization stands to be available to many more customers, and drastically reduces the complexity of storage management.

Meanwhile, the SC4020 unlocks a tremendous amount of performance that allows Data Progression to go even further.

## FLASH AT THE PRICE OF DISK

Specifically, with the SC4020, Dell has methodically architected the system to deliver the full performance of any assortment of disks, and has preserved the SC8000's use of multiple types of SSD. Just like the SC8000, an SC4020 can be configured with SLC-based write-intensive drives together with MLC-based read intensive drives to optimize cost and performance for all workloads. Data Progression recognizes each of these types of disks, treats them as individual tiers within the storage system, and moves data pages to the right tier based on IO pattern. Most important though, is Data Progression's blending of these SSD tiers with HDD tiers behind every virtual volume in the SC4020. This allows customers to store the right data blocks in the right place at the right cost at the right time, while achieving the incredible performance that only SSD can provide. Moreover, Dell claims even better

### A Hands-on Overview

While the SC4020 may be a new product for Dell, the underlying technology has been thoroughly tested and matured over the past 10 years. Management as well as system integration are tremendous benefactors. While assessing the SC4020, we had the opportunity to conduct a feature walk-through using an SC4020 system in Dell's Eden Prairie, MN facility.

We walked through the SC4020's features and capabilities, including system setup, provisioning volumes, configuring tiering policies, and looking at system reports for utilization, errors, and on-going performance. We found that the SC4020 fit seamlessly into a mixed Storage Center infrastructure, enabling side-by-side management with the same tools as the SC8000, and easy transparent interoperation of key features like system-to-system replication.

The screenshot displays the Dell Enterprise Manager interface for a storage system. The main view shows the configuration for 'Ora-2', which is connected to two servers. The interface includes a navigation pane on the left, a central summary area, and a detailed configuration table for the storage system.

Name	Port Type	Connectivity
2001000E1E09F358	Fibre Channel	Up
2001000E1E09F359	Fibre Channel	Up

Controller	Controller Port	Path Status	Purpose
SN 61193	5000D31000EF0921	Up	Front End
SN 61193	5000D31000EF091F	Up	Front End
SN 61194	5000D31000EF0926	Up	Front End

Figure 2: Dell Enterprise Manager showing the configuration of an SC4020 storage system connected to two Redhat Linux Oracle Servers.

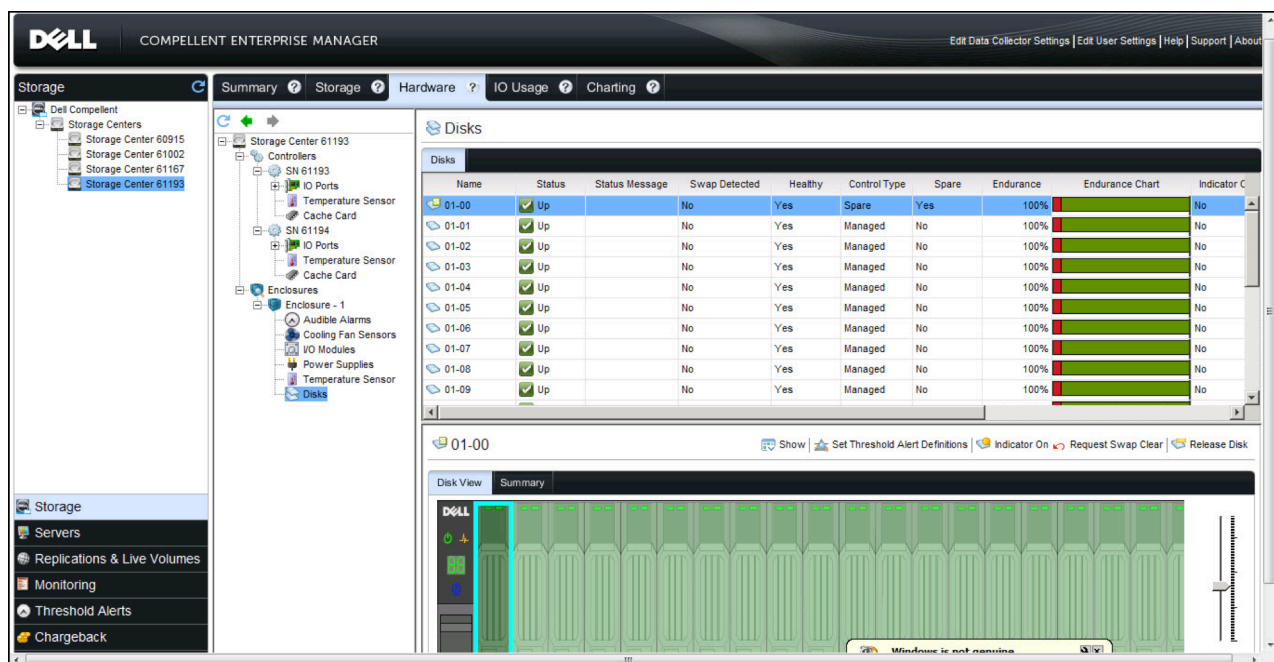
performance and cost than competitive hybrid array configurations, as the use of SLC SSDs can deliver superior write performance, but can be blended with more cost-effective MLC SSD and rotational HDD to fully optimize total system cost. With this approach, Dell has made SSD more economical per GB than the fastest HDD, demonstrating the tremendous value of Data Progression – a technology that with the SC4020 is now within the reach of many more customers than ever before.

## EFFICIENCY DOWN TO THE NUTS AND BOLTS

But the SC4020 efficiency message in our view goes even further with its space and power efficient footprint. Through Taneja Group’s informal component-level analysis, we believe the SC4020 2U controller appliance will consume only about 40% of the power utilization of the SC8000, and through the use of flash, customers may be able to meet green energy goals or deploy a feature-rich Fibre Channel storage array in many places that previously couldn’t meet the power requirements of a more traditional array. On the data center floor, this may make special purpose deployments for Virtual Desktop storage or data analytics clusters highly practical.

## A STRATEGIC ENTRY INTO ENTERPRISE STORAGE

Finally, with the SC4020, a small package doesn’t mean a partial or disposable solution. The SC4020 is fully feature-enabled, and can be managed through the same single pane of glass Enterprise Manager that supports the SC8000 array. As we’ve mentioned, features like Data Progression, system integrations (VMware vCenter), replication, and even routine monitoring and visibility features (like in Figure 2), have been honed to maturity over a number of years, and are highly capable. The current Dell enterprise storage customer benefits from the matching features and capabilities of the SC4020, as it is a seamless experience to add SC4020 storage to an existing SC8000 infrastructure for workload isolation, department needs, or even remote offices. Moreover, new customers stand to



**Figure 3: Dell Enterprise Manager’s wear level tracking at the individual device level, using different algorithms for write-intensive SLC drives versus read-intensive MLC-drives is one illustration of the maturity of SC4020 features and capabilities.**

benefit too – the SC4020 can be an ideal entry point from which to develop familiarity and a skillset that can grow with an organization, and more importantly, Dell has defined an upgrade path that can preserve the value of the customer’s investment should they upgrade to a larger SC8000 storage system later. Compellent products employ perpetual licensing. This enables customers to convert to a larger SC8000 with smaller upgrade license, rather than paying the full upfront price for an entirely new larger license when changing controllers

## TANEJA GROUP OPINION

The Dell SC4020 maintains Dell’s tremendous storage technology pedigree, while bringing this technology to the market at a disruptive price point, and with disruptive small system density and efficiency achievements. In turn, we believe Dell stands to make serious waves in the storage market by putting enterprise-class storage within the reach of a number of new customers and use cases:

**Serious storage for the smaller storage needs.** The SC4020’s flash-at-the-price-of-disk low cost entry point, small configurations, high performance, and lasting investment value (through a defined upgrade path), opens up serious enterprise storage technology for nearly any storage customer, from small SMBs looking at server-attached storage, to workgroups or departments that need dedicated storage systems. While the SC4020 does more than just Fibre Channel, many smaller customers who have long enjoyed the ease of network fabric isolation, high availability, and throughput efficiency of Fibre Channel can also benefit from Dell’s proven FC storage architecture at a low entry price point. Moreover, the SC4020 brings not just Fibre Channel, but serious enterprise storage technology to go along with it. That pairing delivers long-term value from the customer’s investment.

**The hybrid storage customer looking for serious performance in a small footprint.** Dell may also be setting a new watermark for small footprint hybrid storage arrays with the SC4020. While there are lots of contenders in today’s marketplace, we have yet to see such an elegant combination of SLC and MLC flash media alongside rotational HDD by any other vendor, and the architecture looks poised to take flash performance to extremes, while also delivering extreme cost advantages through this blended mix of media that can optimize every data page in the system.

**Enterprise storage for the distributed enterprise.** Many enterprises have long paid a cost for maintaining enterprise-class data center storage while also trying to deliver storage for distributed remote or branch offices. This usually results in lower cost and capability storage for the branch office, and this in turn forces administrators to learn new configuration and management tools, while complicating data protection and replication. The Intel powered SC4020 can bring enterprise-class storage to the branch office that integrates with the management of data center storage, and enable the administrator to employ integrated replication technologies for data movement and protection.

**Cost effective disaster recovery storage.** Similarly, many enterprises face serious cost and resource constraints when it comes to implementing cost effective disaster recovery approaches. This is most often due to the cost of a secondary storage system. The SC4020 makes an ideal replication target for businesses trying to build a DR solution for their SC8000-based data centers.

**Storage for dense, efficiency-driven customers.** Finally, in our view the SC4020 is also a serious density and power efficiency achievement. As a small-footprint-optimized storage system, the SC4020 looks poised to let customers with power constraints still deploy serious storage technology. Any green-focused business may find that the SC4020 controller alongside Dell's range of flash SSD technology will deliver greater capacity and performance per watt than competitors.

As Dell marches their enterprise storage technology into these customer accounts, we think they'll consistently redefine the value of storage, and shift customer capabilities and economics, thereby democratizing data storage. The market is filled with competition, but there are no other established vendors bringing this broad of an assortment of technology to this range of customers with the simultaneous promise of lowering total cost of ownership as well as creating enduring and transferrable investment value.

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